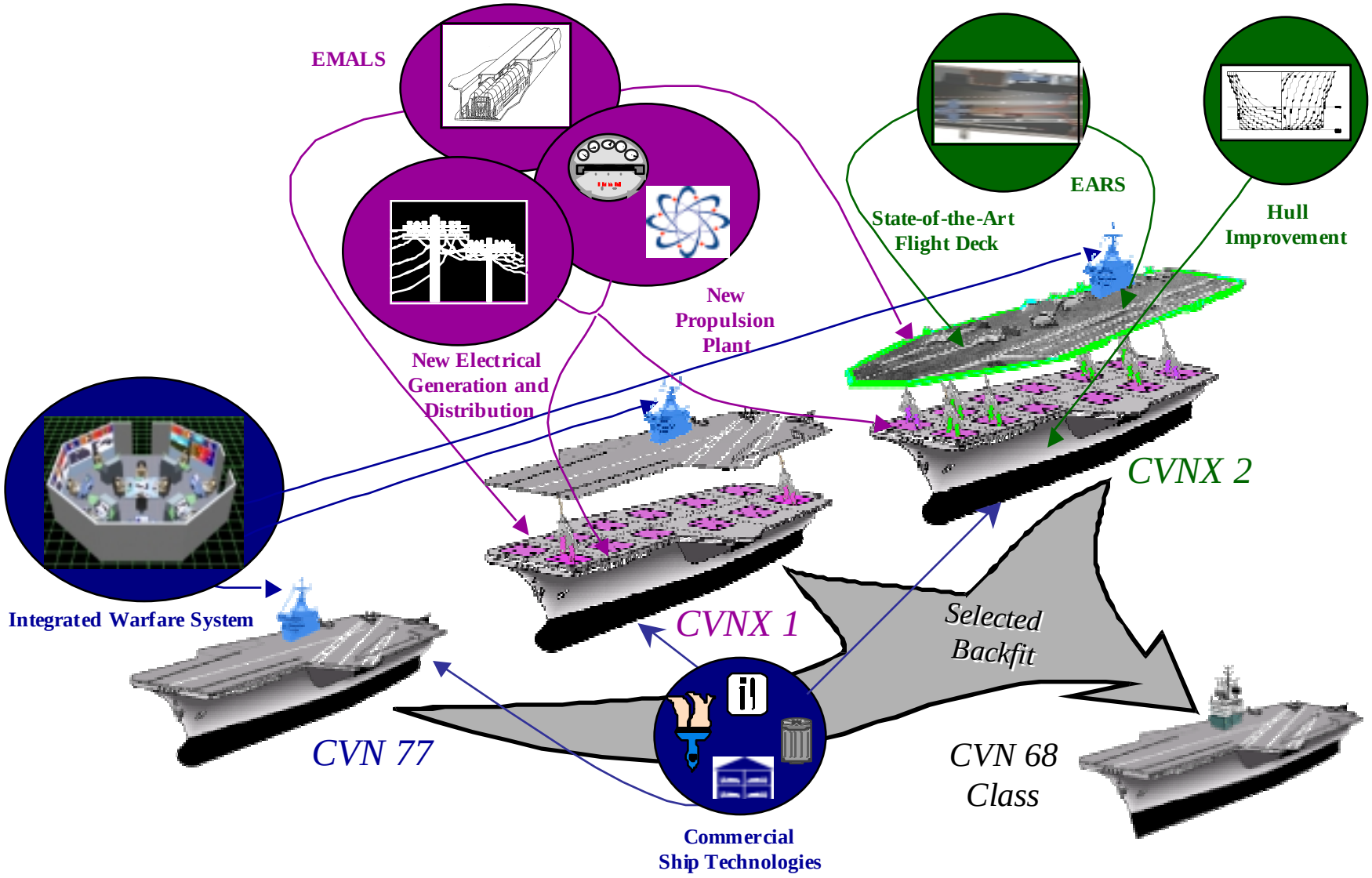
Aircraft Carrier
Ordnance & Material
Stowage & Handling Priorities

11 June 2001

The 21st Century Aircraft Carrier
"An Evolutionary Approach"



PEO Aircraft Carriers Technology Insertion Opportunities

The Evolutionary Approach ...

10 Yrs 20 Yrs

Future Carriers

2006 Award CVNX 1 DDC Contract

2007 CVN 77 Delivery

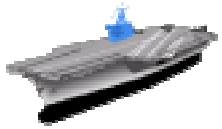
2011 Award CVNX 2 DDC Contract

2013 CVNX 1 Delivery

2017 CVNX 2 Delivery

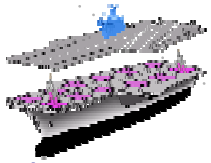
02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

2001 2025



CVN 77

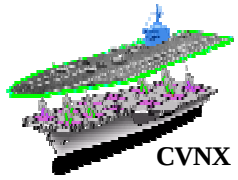
CVN 76 Baseline R2 Plus:
Integrated Warfare Systems (IWS)
Applicable Change Orders & COTS Insertion
Smart Carrier Efforts



CVNX 1

CVN 77 IWS Plus:
New Propulsion Plant
Zonal Electrical Distribution System (ZEDS)
Electromagnetic Aircraft Launch System (EMALS)
Reverse Osmosis Desalination
HSLA-65 Materials Development & Integration
Survivability Options (Long Lead Work)

Other:
Warfare Systems Refresh Ph I



CVNX 2

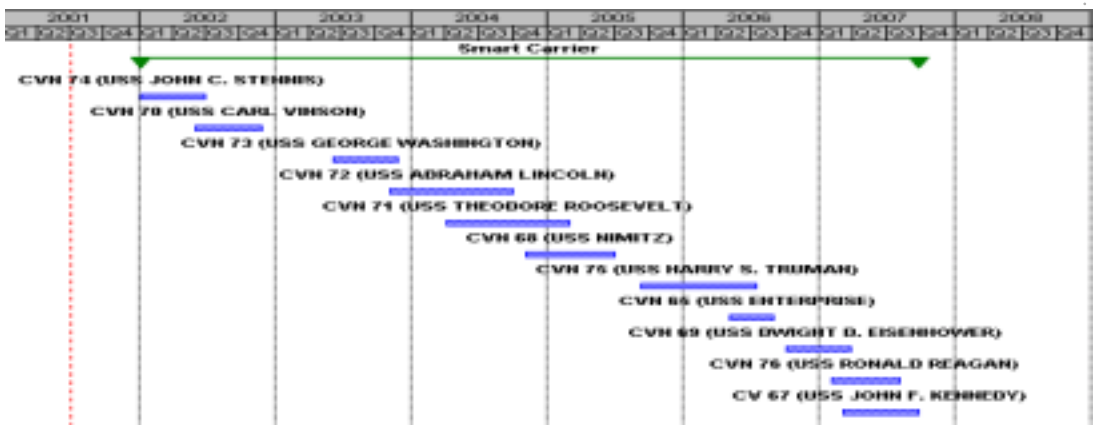
CVNX 1 Plus:
Survivability Improvements To Meet New Threats
Restoration of SLA
Functional Rearrangements
Latest Technologies To Further Enhance Flight Deck Ops, Including Electromagnetic A/C Recover System (Rotary EARS)

Other:
Warfare Systems Refresh Ph II

In-Service Carriers

CVN 69 RCOH | CVN 70 RCOH | CVN 71 RCOH | CVN 72 RCOH | CVN 73 RCOH

Smart Carriers



Carrier Priorities

- **Key Performance Parameters (KPPs)**
  - Reduce Vertical Center of Gravity (VCG) and Weight
  - Increase Interoperability
  - Increase Sortie Rate Reduce
- **Total Ownership Cost (TOC)**
  - Acquisition Cost
  - Manpower - Watch Stations
  - Manpower - Workload
  - Operations & Support (O&S) Cost
- **Reduce Total Ship Integration Impacts**
  - Electric Load, HVAC, Cooling Water, Arrangement, Supportability

Carrier Logistic Systems Issues

- Material handling should be addressed as an integrated "system" instead of a series of individual steps
- The ability to quickly adapt from a low volume to a high volume material/ordnance movement capability will have to take into account in the Carrier BG internal and external "logistics system" design
- Technology offers an opportunity to integrate order, delivery, strike-down, receipt, stowage, inventory, issue, retrograde, and re-order
- Adding manpower requirements into the material handling equation forces automation into current manpower-intensive material handling process
- Process revision and design and arrangements are as important design enablers as technology

Ordnance & Material Handling Systems

- **Deck to Deck Transfer (UNREP)**
- **Strike-down / Strike-up**
- **Magazines and Storerooms**
- **Automated Inventory Tracking and Selective Retrieval**

Ordnance & Material Handling Includes…

- Fuel- JP-5, MOGAS, DFM
- Ordnance- Bombs, missiles, mines, components
- DTO and Replenishment repair parts
- Subsistence- Freeze, chill, dry
- Ships store- Clothing, small stores
- Other/Special- nuclear, Level 1, O2 Clean, PUKs
- Consumables- admin, personal clothing, maintenance
- S&TE- Handling equipment, SPETE, GPETE, laboratory
- Mail- Official, personal, bulk
- Retrograde- Reusables, DLRs, recycling
- POL/HAZMAT- maintenance
- Bottled gasses- medical O2
- Medical/Dental- supplies, pharmaceuticals, repair parts
- Habitability- bedding, furniture
- ADP- hardware, software, firmware, peripherals
- Aviation- ALRE, fuel tanks, buddy stores, engines
- Unique- DC, deck, UNREP
- Boats- RHIBs,

Current Limitations

Ordnance & Material Movement is Labor Intensive

- 400+ personnel working parties for major UNREPS/"load aboards"
- Use department personnel for own material movement
- Cumbersome Cargo Flow
  - Pallets/cargo and retrograde moved either by hand, hand trucks or forklifts on hangar bay and flight deck
  - Stores transported to storerooms by hand using vertical package conveyors
  - In-port loading done by pier-side cranes, conveyor belts to lowered elevators or hand carried on board
- Restrictive Weapons Flow
  - Ammo moved to magazines via hand trucks/forklift onto weapons elevators

Current Limitations

Material Handling, Stowage and Visibility

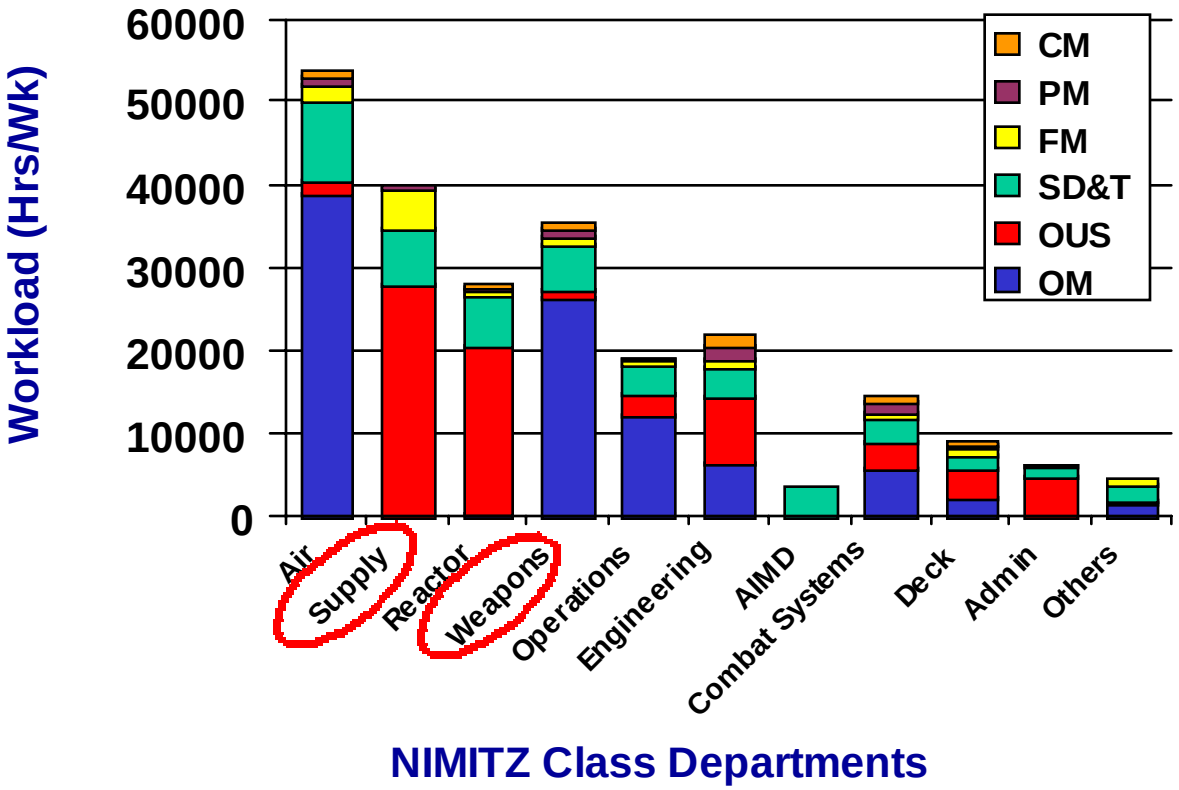
CVN-68 Class Material Handling

- **UNREP receive rates far outpace ability to efficiently move cargo into stowage**
- **12 package conveyors provided**
  - Labor intensive (3 or 4 sailors per load & unload deck just to operate)
  - Work party of 50 (25 per deck) for load & unload
- **Food stores broken out daily**--STENNIS uses 125 man working party 4 times/day vice conveyors
- **Storeroom access very difficult** e.g. 1/2 of S-8's 23 storerooms require opening a 12-tie watertight access hatch
- **Parts stored on hangar bay due to lack of storeroom space (hangar bay "Mountain")**
- **Lack real-time data bases and direct connectivity to research, locate and request material from other ships in the Carrier BG**

Current Limitations
Packaging and Handling

- **All Cargo (food, parts, etc) is delivered using pallets**
  - **5700lbs. max for CONREP**
    - **Up to 10,000lbs. special lift for arresting gear cable and jet engines (CONREP only)**
  - **4000lbs. max for H-46 VERTREP (3500lbs. SWA)**
  - **6000lbs. max for CH-60 VERTREP**
- **Ordnance**
  - **Is packaged not to exceed 4000# VERTREP weight limits**
    - **e.g. 6X500lbs. MK-82 casing = 3000lbs, 2X2000lbs. MK-84 casings = 4000lbs., 1AIM-9X container (4msls) = 1282 lbs.**
  - **Sized by weapons elevator**
  - **No maximum volume (ft^3) limitation specified, but some precision bomb, bomb kits and missile containers more a volume issue than weight issue**
    - **Sidewinder (AIM-9) = (2) 55.23 ft3/Cntnr = 2564 lbs. = 1 lift**
    - **JSOW = (1)100.5 ft3/Cntnr = 2135 lbs.= I lift**

Where the Workload Is



All departments involved with material handling

Future Ordnance / Material Handling Technologies

- ✓ Improved material handling equipment
- ✓ Electric elevators
- ✓ Automated storage and retrieval systems
- ✓ Automated Info Technology solutions
- ✓ Clustered storerooms
- ✓ Shore-based Interface
- ✓ Improved internal arrangements
- ✓ Inter-ship / Intra-ship processes

New Technologies, Designs and/or Procedures

The Navy's 21st Century UNREP and material handling systems must permit sustained and unimpeded Battle Group combat operations

Carrier Logistics Circle of Life

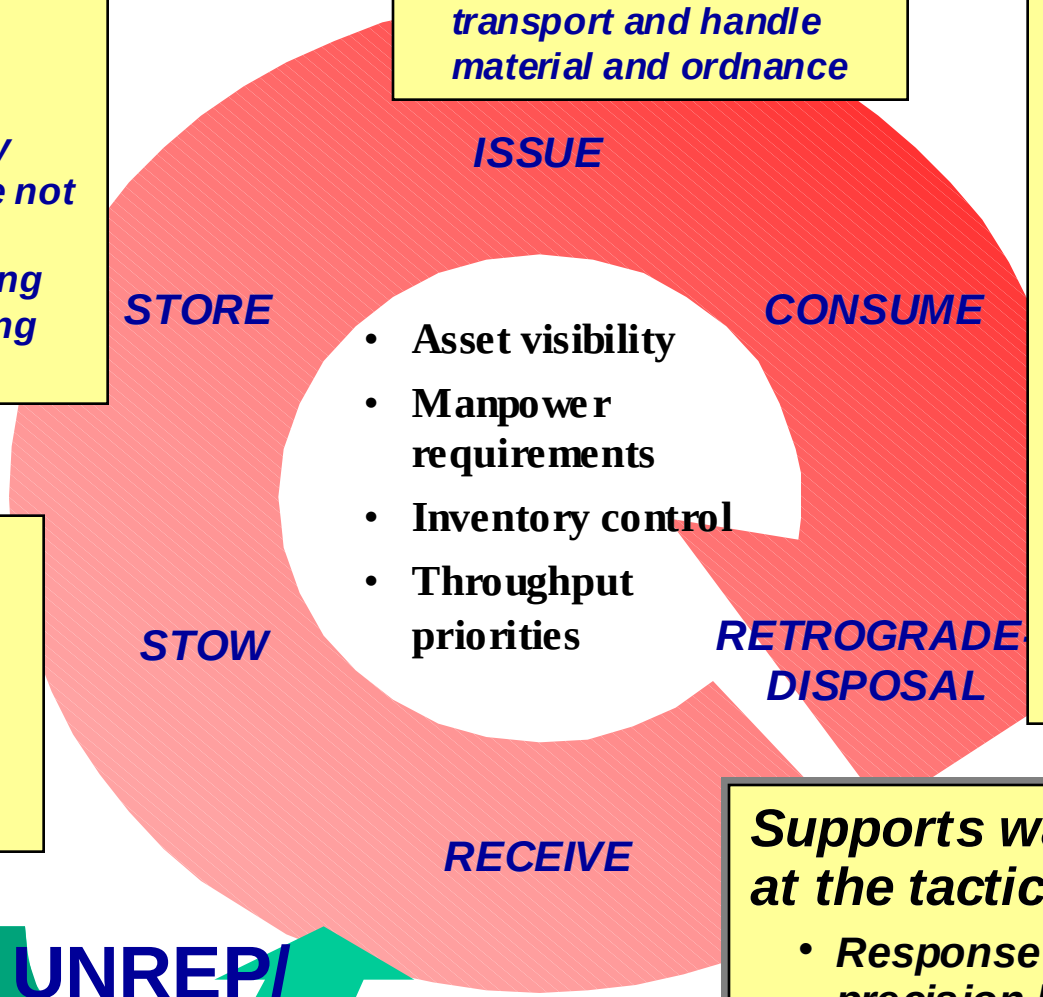
Presence/Crisis

- *Prior to open hostilities, fuel normally drives UNREP frequency*
  - *JP expenditure not much different once the air wing starts expending ordnance.*

- *Separate departments and systems to transport and handle material and ordnance*

Hostilities/Crisis

- *Open hostilities, ammunition resupply drives UNREP frequency*
  - *Diverse target set requires flexible and responsive ordnance load out capability*
  - *Ordnance anticipated to be very mission specific requiring continuous asset visibility and tracking (from resupply ship to CVNX magazine to flight deck to aircraft)*
- *Theater ammunition resupply will impact sustainability*
  - *Airlift of high priority ordnance will compete for assets*



- *Current UNREP limitations still applicable in 2015+*
- *Higher reliance on MSC and charter ships*

UNREP/ INREP

Supports warfare operations at the tactical level

- *Response to call for fires with precision long range weapons*
- *Large volume of sorties*

Carrier Ordnance and Material Handling Challenges

- Can material handling and ordnance handling equipment be combined to reduce redundancy?
- Can future designs and program goals capitalize on commonalties between processes?
- Does the Navy's 21st UNREP/material handling systems permit sustained and unimpeded Battle Group combat operations?

Conclusions

- **Carriers need new material handling processes and systems in order to operate efficiently in the 21st Century:**
  - **Fiscal constraints decree a less expensive aircraft carrier**
  - **Material endurance requirements will be tailored to support Design Reference Mission**
  - **Process and policy revisions will increase efficiencies**
  - **Automation / technology are needed**
  - **Provide / receive services from legacy and new systems**

Summary

- **Cost including Manpower and Life Cycle Support, Weight, Vertical Center of Gravity (VCG), and Sortie Rate are critical to selection**

- **Planning for CVNX but transition to In-Service ships first if possible**